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ABSTRACT

This teaching unit provides materials and information about the effects of El Nino on people, the economy, and nature around the world. It is important for students to know the impact El Nino has had on the world. The unit presents information that builds student's interest in other environmental phenomena as well. This unit offers information on societal issues such as land and property destruction and how that affects the world's population economically. This helps students learn how governments and leaders deal with these issues. Students take part in research and use resources available to gain knowledge and experience in research techniques. Sixth-grade language arts, social studies, science, and mathematics standards were taken from the instructional goals and objectives of West Virginia as guidelines addressed in the unit. (BT)

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ED 431 679

WHAT IS EL NINO AND HOW DOES IT AFFECT US?

SO 030 817

Ann L. Mutter

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Rationale

This unit provides materials and information about the effects of El Nino on people, the economy, and nature around the world. This is important for the students to know the impact El Nino has had on the world. This unit provides information that could spark more interest from the students, not only in El Nino, but other phenomena as well.

This unit provides information on societal issues such as land and property destruction that effects the world's population economically. In turn, the students learn how governments and leaders deal with these issues.

The students take part in research and use resources available to gain knowledge and experience in research techniques. These skills encourage life-long abilities to learn and think analytically. The unit was designed around techniques and procedures that best help the students learn. Sixth grade Language Arts, Social Studies, Science, and Math standards were taken from the West Virginia Instructional Goals and Objectives as the guidelines that addressed in the unit.

Learning Outcomes:

How Does El Nino Effect Us?

Overall:

How did El Nino effect us in 1997?
What is El Nino?

Science:

What are the short term vs. long term results?
What do we know about it? What don't we know?
Why does it happen?
What are its effect on natural resources and nature? (Tropical rain forests, Africa)

Social Studies:

How much money has been lost from devastation?
How are El Nino's effects different for poorer nations than for the more wealthy nations?
What happened in past El Ninos?

Math:

Can we make any assumptions from the charts and data obtained?
Statistical analysis of the impact of El Nino?
How can we illustrate the changes (money, rainfall, etc) to help people understand the impact of El Nino?

Students will:

(Knowledge)

-be able to define El Nino.

-discuss the impacts of El Nino on the world.

-identify characteristics that we still do not understand about El Nino

-recognize past El Nino effects

(Skills)

-be able to interpret data on the effects of El Nino

-systematically research El Nino using standard strategies from science, social studies and math or develop and carry out a plan of research.

(Attitudes)

-explain how El Nino effects the economies in poor vs. rich countries.

-explain impacts of how El Nino has effected nature/environment and might in the future

-recognize the interdependence of the climatic system of the world and the impact on various national economies

Portfolio Assessment

As part of the final assessment on the El Nino unit, students will be required to develop an original portfolio. The portfolio will contain works completed in Sciences, Math, and Social Studies, which answer the overall questions: "How does El Nino effect us?" In the portfolio, the students must also submit a creative writing work dealing with one or more issues discussed on El Nino during the study. It will include original art and graphics to illustrate focus and conclusions. In addition, students are encouraged to include any work of their choice which they feel best demonstrates their knowledge and synthesis of the unit material.

The final portfolio will count for 25% of the unit grade. The other 75% will be distributed among the individual grades in Science , Math, and Social Studies. The portfolios will be evaluated on whether or not the student is able to effectively explain the overall question of the unit as illustrated in accurate and complete class assignments and the final paper's accuracy and issue presentation.

Individualizing for Special Needs Students:

These are the services we plan to provide for these students.

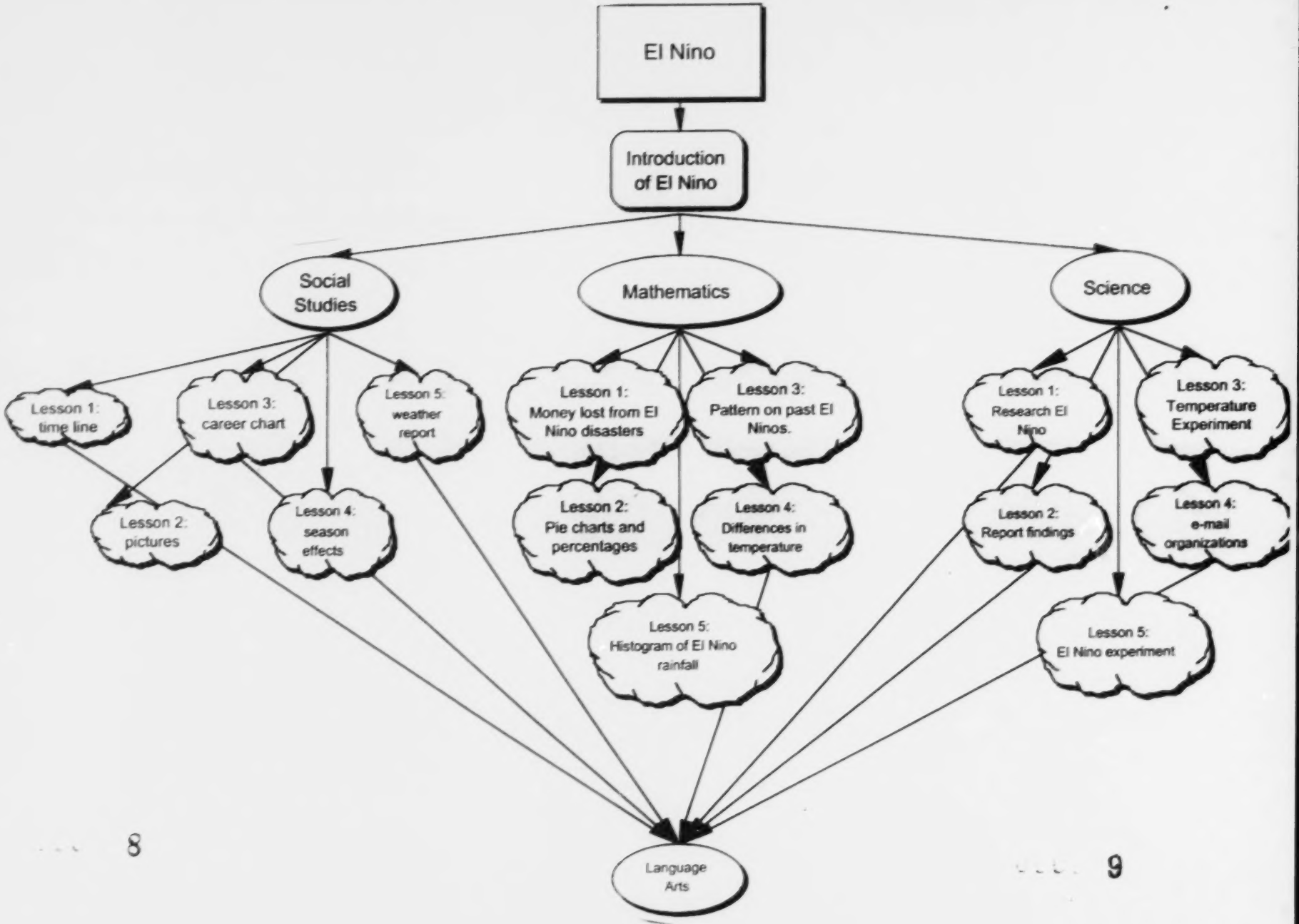
-provide group work for all students, allowing special needs students especially to have peer support.

-Provide as many concrete instructional materials as possible.

-Relate lessons and objectives to real-life situations, especially ones special needs students could relate to

-make reading material developmentally appropriate for students by rewriting passages and using resources written at various reading levels

-teacher will have individual conferences with students to assess their understanding and provide support needed, such as tutoring, more examples, reading help, etc.


El Nino
Introduction of El Nino
Social Studies
Mathematics
Science
Lesson 1: time line
Lesson 3: career chart
Lesson 5: weather report
Lesson 2: pictures
Lesson 4: season effects
Lesson 1: Money lost from El Nino disasters
Lesson 3: Pattern on past El Ninos.
Lesson 2: Pie charts and percentages
Lesson 4: Differences in temperature
Lesson 5: Histogram of El Nino rainfall
Lesson 1: Research El Nino
Lesson 3: Temperature Experiment
Lesson 2: Report findings
Lesson 4: e-mail organizations
Lesson 5: El Nino experiment
Language Arts

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Time: 30-45 minutes

Materials list:

5 different articles related to El Nino and its devastation
enough copies for everyone in the class to have a copy of one

IGOS: Science 6.5
Language Arts 6.20, 6.25

This is the very first concept lesson that is taught so that students will gain a basic understanding of El Nino before the unit begins. The lesson will introduce the topic of El Nino to the students. It will pique student interest in the abnormal happenings to create disequilibrium and provoke thought.

1. Objective: Students will brainstorm what they have heard about El Nino.
Assessment: By observing the students conceptions of El Nino, the teacher will be able to determine their depth of knowledge coming into the unit. Every group will be required to go to the board and write something.

El Nino will be written on the board. Students' prior knowledge will be activated by asking students what they know about the concept. Divide them into groups of four and have them brainstorm together to create a list of ideas about El Nino. A representative from each group will come to the board and record the thoughts of the group.

2. Objective: Students will read critically through different articles to gain more information about El Nino.
Assessment: Students will be evaluated on their ability to stay on task and to generate another list of characteristics to put on the board.

Give each student in every group an article on El Nino. After reading, brainstorm again about characteristics of El Nino. Compare and contrast the two lists. What's different? What's the same? How do we know which list is more accurate?

On the overhead, the teacher and students will generate a combined list of ideas to keep throughout the unit.

Explain to the students that how El Nino effects us is a topic we will be addressing for the next several weeks. At the end of our study, we will revisit the lists to evaluate the accuracy and add new things we learn.

Social Studies: Lesson 1

Time: 30-45 minutes

Materials:
oak tag paper for time lines

IGOS: Social Studies 6.57, 6.58
Language Arts 6.56

In the first Social Studies lesson, the teacher will generally review the characteristics of El Nino that the students' listed in the first concept lesson. At this point, the teacher will list several disasters and other happenings that have occurred in the past 100 years that have been attributed to El Nino. The students will then make a time line reflecting these events and make generalizations.

1. Objective: Students will organize data from the board into a sequential time line.
Assessment: Students will be assessed according to their ability to place the dates and information in order.

The teacher will put the overhead with all of the characteristics of El Nino on the overhead. Students' memories will be refreshed by some of the items that are listed. On the board, the teacher will have previously listed several events or disasters that have been attributed to El Nino. The students will be instructed to take this data and put it in sequential order by date. They will then be required to construct a time line that contains all of this information. They may write out the words or they may come up with their own symbols to be used on the map, but there must be a key if this is done. Students also need to determine if there are any regular trends; groups of events that happen together or near each other.

2. Objective: Students will interpret the data from the time line to make generalizations about El Nino.
Assessment: Observation of the students' ability to generalize about the pictorial representation will determine the assessment.

After students have completed the time line, they will be asked to think about what we can learn about El Nino. What are some things that happen repeatedly? Some examples might be, El Nino happens every ten years, the same places are always effected, the same kinds of storms return to the same places, etc.

3 Objective: Students will keep a journal about topics selected by the teacher about El Nino.
Assessment: Assessment will occur through the completion of the project as part of the overall portfolio.

After students have completed this assignment they will be asked to decorate a journal cover. Throughout the study of El Nino they will be asked periodically to write entries in the journal.

Lesson 2

Time: 45-60 minutes

Materials:

Pictures of natural disasters caused by El Nino from Life Magazine, 1997-98

IGOs: Social Studies 6.31, 6.45
Language Arts 6.56, 6.64

This lesson will focus on the difference between having a disaster in an undeveloped versus a developed country. A working definition of these terms will be identified.

Objective: Students will pick on of the pictures on the board and write a descriptive paragraph about having lived through that disaster.
Assessment: Students will be evaluated according to their ability to empathize for the people in the disaster. The kinds of examples and feelings that they include will be considered.

On the board, the teacher will have about eight different pictures from disasters that have occurred during El Nino. The pictures should cover a variety of countries and different disasters (locations will be pointed on the map as well). This is important so the students can see the widespread effect of the anomaly on the environment.

The students will be asked to look at the different pictures for several minutes. What are some of the similarities and differences that can be seen between the pictures. A major difference that should be brought out is the difference in the way the people are dressed and the kinds of places that live in. The different kinds of disasters that the pictures represent should also be considered.

Explain to the students that these pictures come from all over the world. Different places in the world have different ways of doing things and different ways of living. Not everyone wants the material objects that we here in the United States or goes to work in a building. Many people work outside for a living, or in factories. Because of this fact the amount of money that they have varies from place to place. So, when a disaster hits, it will hurt some countries worse than others.

Ask the students to pick one of the pictures and to picture themselves going through the storm. What kinds of things would you be feeling? What kinds of things would be happening? What kinds of people or things would you be looking to for help? You may also draw a picture describing how you would feel.

This will go into your journal which will be a part of your portfolio.

Lesson 3

Time: 30-45 minutes

Materials:

play money
Previously made language chart

IGOS: Social Studies 6.21, 6.31, 6.45, 6.57

In this lesson, students will gain an understanding of the different kinds of professions that people around the world have and how El Nino might effect them.

Objective: Students will identify different professions and jobs throughout the world that El Nino effects.
Assessment: Students will be evaluated according to the language chart that is produced and their understanding of the money demonstration.

On a chart with four rows and two columns the students will analyze the different ways that people are effected by El Nino. The teacher will ask the students to brainstorm some of the professions that have to deal with the ocean and weather that might be effected by El Nino. Once a list has been generated, the teacher will choose four professions from the list to put on the chart. The students will then think about how El Nino effects these people. One that should definitely be considered is a fisherman in different parts of the world.

Objective: Students will associate the amount of money that a person makes to the amount of damage that can be caused by El Nino.
Assessment: Students will be evaluated according to attentiveness and understanding of the subject. Students will also be required to write a journal entry on what the difference between a developed and undeveloped country is.

The teacher will ask for four volunteers to come to the front of the room. Each person will take upon the role of each one of the professions that has been discussed. The teacher will then give that character the amount of money that would be made if they lived in an undeveloped country and a developed country. A disaster will hit these people wherever they are hidden. The teacher will take away the amount of money that the disaster cost. The students will then be able to see which country is more effected by disaster. Conclusion: The country with less money will be more effected because they do not have the money to invest in rebuilding.

Lesson 4

Time: 30-45 minutes

Materials:

Paper
coloring materials

IGOs: Social Studies 6.21, 6.31, 6.57

This lesson will focus on how El Nino effects those professions in the United States that depend on the weather for success.

Objective: Students will analyze how El Nino effects those working seasonal jobs in the United States.

Assessment: Students will be evaluated according to the four-part drawing they will be required to draw.

Paper will be passed out and students will be asked to fold the paper so that there are four quadrants. They will be instructed to in each quadrant to draw a picture about something that we do in every season, summer, winter, spring, and fall. The pictures are to be colorful and meaningful. What are some things that your family does? What kinds of jobs do people do during the seasons.

As people are finished, students will be asked to write in their journal about their favorite season and how El Nino might be effected.

When most students are completed, a discussion will ensue about the different types of jobs that seasonal. Beaches, Ski resorts, fisherman, rangers....all of these people depend on the weather to be predictable, but with El Nino, the weather is not predictable. Summarize the impacts and then ask, "In addition to the fishermen and farmers in the developing world we talking about having loss of income during El Nino. Are there any of the same occupations impacted in the U.S. who might also have a loss or gain in their incomes?"

Lesson 5

Time: 60-90 minutes

Materials:

video camera(s)
video tapes
umbrella
boots
any kind of weather accessories

IGOs: Social Studies 6.13, 6.31
Language Arts 6.63, 6.64

This lesson will allow students to bring our study of Social Studies and El Nino to a close by concentrating on how it effects the students personally and their immediate community.

Objective: Students will develop a weather report for their hometown that includes talk of what El Nino is and how it will effect our community.
Assessment: Students will be evaluated according to their ability to incorporate ideas that have been discussed during class and use specific examples of how the community will be effected.

The teacher will ask students to think about how El Nino will or already has effected them. Have they had many snow days? Has it been really dry? Has it been really warm or dry? Etc. The students will be asked to write a weather report in small groups that would be for a normal day in their hometown. The report must make reference to what El Nino is, how it has effected other areas, and how it will effect our town.

When the students have completed writing their report in groups of three, the report will be videotaped so that we may watch them later. There are props and other such things available for students to utilize as they write their report. They are encouraged to be creative and to make any props they might need.

Resources for Social Studies El Nino

1. "Is it El Nino of the Century?: Shifting Ocean Currents in the Pacific Could Trigger Dramatic Swings in the World's Weather". Time. (18 August 1997).
http://cgi.pathfinder.com/time/magazine/1997/dom/970818/science.is_ut_el_nino.html

The article gives a brief history of El Nino and its general effects and predications for 1998.

The article was used in the unit as a reference giving the amount of money that was lost in the country and as a general information resource.

2. "The Bad Boy is Back: But no one knows how bad El Nino will be." Newsweek.
http://www.pathfinder.com/asiaweek/97/1010/feat2.html.

The article gives a brief history of El Nino and some of the trends that have occurred in the past. There is also a chart that describes the severity of each El Nino during this century.

The article is used in the unit as a reference for information and with regard to the money demonstration, the chart was very helpful.

3. "History of El Nino: Tracking a Global Mystery." Environmental News Network.
http://www.enn.com/specialreports/elnino/history.asp

The article describes the effects of El Nino on animal life and such throughout the century. It also identifies some of the researchers that have made great strides to find the secrets of El Nino out.

There is a great graph on the front page that describes the history of El Nino over the last 200 years. The history will be used in the time line the students must design.

4. "Weather Causes Record $89B Damage." Washington Post.
http://search.washingtonpost.com/wp-srv/WAPO/19981127/V000343-112798-idx.html

The article describes the types of damage that has been done during El Nino this year. It covers many of the different countries and the different things that are happening.

This will be useful when the students are thinking about the different kinds of effects that El Nino has on different countries.

5. "The impacts of El Nino." Environmental News Network.
http://www.enn.com/specialreports/elnino/impact.asp.

The article is a summary of the different impacts around the world. It also has links to different research agencies that have updated research on El Nino.

This will be effective in the unit when the students write their letters to a professional dealing with El Nino.

Time: 45 minutes
Materials list: Information taken from web site http://www.coe.tsouthal.edu/el_nino.html ,
worksheet on El Nino, computers that are Internet accessible

This instruction activity lets the students research for themselves and find information about a phenomenon (El Nino) that effects the whole world. All the content is to be found on the Internet by the students.

First objective: In groups of two or three, given a worksheet with questions about El Nino, the students are to come up with ideas on researching El Nino on the Internet. In a whole class discussion, teacher asks: "We've been talking about El Nino, where would you begin looking for information about El Nino?" "What subjects might include information about El Nino?" "What might be a good way to start in finding information about El Nino?"—Probe for net searching techniques. Assessed by participation in discussion.

Second objective: Students research information on El Nino to complete the worksheet. They are to work together in finding the answers to questions given on a worksheet about El Nino. They will be assessed on the completion of the worksheet and their participation on the assignment.

*Suggest to student that assignments they feel are pertinent should be added to portfolio.
Related IGO's Science 6.19

Names_____

Answer the following questions in complete sentences.

1. What is El Nino?_____

_____

_____.

2. Where is El Nino located?_____

_____.

3. How is El Nino created?_____

_____

_____.

4. Describe the weather changes caused by El Nino._____

_____

_____.

5. What are some effects that El Nino has on plants and fish in the ocean?_____

_____

_____

_____.

Time: 40 minutes
Materials list: web site www.ucar.edu , question lists from students

This activity provides experience in designing meaningful questions, and provides students with a way to query informative organizations for information. This can be used in obtaining information about anything that a student wishes to research.

First Objective: Students design meaningful questions about El Nino. The students are given their questions back and asked to get into three groups. They are to discuss amongst their groups the questions they have. They are to put questions together and come up with one good meaningful question they can use. Students will be observed during the process and will have to present their question to the class. They will be assessed on their participation and presentation.

Second Objective: In their groups, the students will design an opening statement from their group to the organization they are emailing. Discuss what they shout put in the statement. For example "We are emailing from Jones Middle School in Morgantown, West Virginia." Have students write the statements with their questions and hand in the final draft. The students will be assessed on their participation on the assignment and the quality of the assignment. Grammar will be counted.

*Suggest to student that assignments they feel are pertinent should be added to portfolio.
Related IGO's Science 6.71 English Language Arts 6.52

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Time: 40 minutes
Materials list: book: Readers Digest: How the Weather Works(1995), pg. 135, web site http://geohazards.cr.usgs.gov/factsheets/html_files/elnino ,food coloring, water, wide clear-sided container

This activity produces a model of an El Nino and gives the students an idea on how they form. The experiment makes it fun for the students and provides a concrete medium for the students to use.

First Objective: Students will observe how an El Nino is formed and what conditions make up an El Nino. Review terms with students such as trade winds and equator. Have class discussion about the conditions of an El Nino. Discussion on the low-pressure region in the western Pacific shifts eastwards, reversing the trade winds and turning the equatorial currents back on themselves. This causes the build up of warm water off the coast of South America. Access the students on their participation in the discussion.

Second Objective: Students observe the making of an El Nino. Teacher performs experiment. Fill container with cold water to within about 4 inches of the brim. When the water is quite still, trickle colored, hot tap water into the container to form a surface layer. Have students observe the thickness of the warm, colored layer of water. Start blowing the water to make a "trade wind" that moves the colored water toward on end. To make the El Nino, stop blowing so that the warm water flows to the other end. Discuss the observations of the students. Assess the students by observing them during the experiment and their participation in the discussion.

Third Objective: Students will produce possible questions to query information centers about El Nino. Have class discussion about what they would like to know about El Nino. Questions include: "What progresses are being made to help predict an El Nino?" "What can the effects of an El Nino be on the environment?" Assess students by having them write three questions they would like to know about El Nino and collecting it.

*Suggest to student that assignments they feel are pertinent should be added to portfolio.
Related IGO's Science 6.66, 6.70

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Time: 30 minutes
Materials list: book: Readers Digest: How the Weather Works(1995),pg. 135, 2 dishpans, water, tape, scissors, 2 thermometers

This activity provides information about the effects of El Nino on the environment. It gives facts El Nino how it may effect our lives and the lives of others.

First objective: The students will identify an arrangements of ways El Nino may effect the plant life, animals and fish in the oceans it effects. Hold class discussion on effects of increasing the temperature of a body of water where life exists. Point out that nutrients cannot penetrate into deep parts of the water because of the increase in temperature. Ask questions pertaining to the plant and animal life: "What would happen if plants were not able to get nutrients needed to survive?" "What would happen to the animals that relied on those plants for food?" "How could this affect us?" "Does anyone eat fish?" "What would happen to fishing industries?" Assess the students by observing their participation in the discussion.

Second objective: Demonstrate the difference in the temperature changes that effects the plants and animals. Have students observe the difference in temperature. Teacher sets up experiment. Tape on thermometer to the inside of each dishpan. Half-fill both of the pans with cold water from the tap. Pour hot water into one of the pans until the thermometer shows a difference of 18 degrees F or 10 degrees Celsius. This is what happens during an El Nino. Have students come up and feel the difference. Have the students discuss their reactions to the noticeable temperature change. Assess by observing the students and their participation.

*Suggest to student that assignments they feel are pertinent should be added to portfolio.
Related IGO's Science 6.15

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Time: 45 minutes
Materials list: book: Reports to the Nation: El Nino and Climate Prediction(spring 1994), completed Internet worksheet on El Nino

These instruction activities provide the students with a variety of information that each group has found on El Nino. The students gain an understanding of the impact El Nino has on parts of the world and the environment. It also provides an example of the temperature change El Nino causes in the sea temp off of South America.

First Objective: The students will find their partners and either complete the El Nino worksheet if not completed or review the completed worksheet that they will present in front of the class. After giving the students time to complete and review the worksheet, the students are to present the information found in front of the class. The students will be assessed on their participation in the presentation, completeness of the worksheet, and quality of the presentation.

Second Objective: Have students reflect on the presentations and content provided by the students. Some questions asked: "What were some interesting details discussed in the presentation?" "Did anyone learn something new?" "What ideas do you now have to better research the topic of El Nino?" The students are observed in the discussion and assessed on participation and insight.

*Suggest to student that assignments they feel are pertinent should be added to portfolio.
Related IGO's Science 6.5

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Annotated Bibliography

Allaby, Michael. (1995). Readers Digest: How the Weather Works. Pleasantville, NY: The Readers Digest Association Inc.

Synopsis: This is a nice science resource that contains many experiments which demonstrates different things dealing with weather. This reference is used for its experiments on "Creating an El Nino", and "Demonstrating temperature change".

Http://www.coe.usouthal.edu/el_nino.html

Synopsis: This site contains information on El Nino. It was used to gain information regarding El Nino.

Http://geohazards.cr.usgs.gov/factsheets/html_files/elnino

Synopsis: This site contains information and data pertaining to El Nino. It was used to gain information on El Nino.

www.ucar.edu

Synopsis: This site contains a question/answer section where you can ask question regarding weather phenomena. It was used for a project assigned to the students.

Wallace, John. (1994). Reports to the Nation: El Nino and Climate Prediction. Spring. No. 3. Baltimore, MD: University of Maryland.

Synopsis: This Journal contains valuable information about El Nino and its effects. It was used by the instructor for information it contained.

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Time: 30-45 minutes
Materials: Worksheet, calculators, paper, pencil, and poster containing a visual aid on the El Nino disasters.
In this instructional activity the students will be presented with a worksheet containing the money lost from natural disasters instigated by El Nino. The students will analyze the data to determine which disaster caused the most monetary loss and why. A poster will be provided for visual representation of the data.

Objective: The students will determine the total monetary loss from flooding, hurricanes, drought and fires.

The students will be assessed by their ability to effectively calculate the total amount of money each county lost as a result of El Nino.

The students will begin by looking at the worksheet that presents the students with actual figures of the money lost in a particular country, as a result of El Nino. As an introduction to this objective I will ask the question: "Do these figures on the amount of money lost as a result of El Nino surprise you?" The students will discuss their opinions on why the figures did or did not surprise them. I will then ask the students to get into groups of four and calculate the total monetary loss from each disaster on the worksheet. I will ask one student from each group to place their answers for a particular disaster on the board. The students will determine that the drought and fires caused the most monetary loss for the countries that they affected, followed by flooding and hurricanes respectively. Again the teacher will conclude this objective by asking the students: "Do these findings surprise you?"

Objective Two: The students will organize the data to find the mean, median, mode, and range. (WVIGO: M6.25, M6.54)

The students will be assessed on their ability to effectively calculate the mean, median, mode, and range for each disaster on the worksheet provided. They will hand in a completed paper with their group answers on them. Each correct answer will be worth one point for a total of 12 points.

The students will remain in their groups of four and they will be asked to calculate the mean, median, mode, and range for each El Nino induced disaster. The students will work together to obtain a solution to each analysis. The students are allowed to use calculators if they so choose. I will once again allow a different student from each group to come to the board and write the mean, median, mode, and range for a particular disaster. The students will then determine the average (mean) amount lost for each disaster, and they will also conclude that on an average the drought and fires accumulated the most monetary damage for the countries they affected. The students will then conclude that the drought and fires cause the most damage because El Nino provoked more drought and fires than any other disaster listed on the worksheet.

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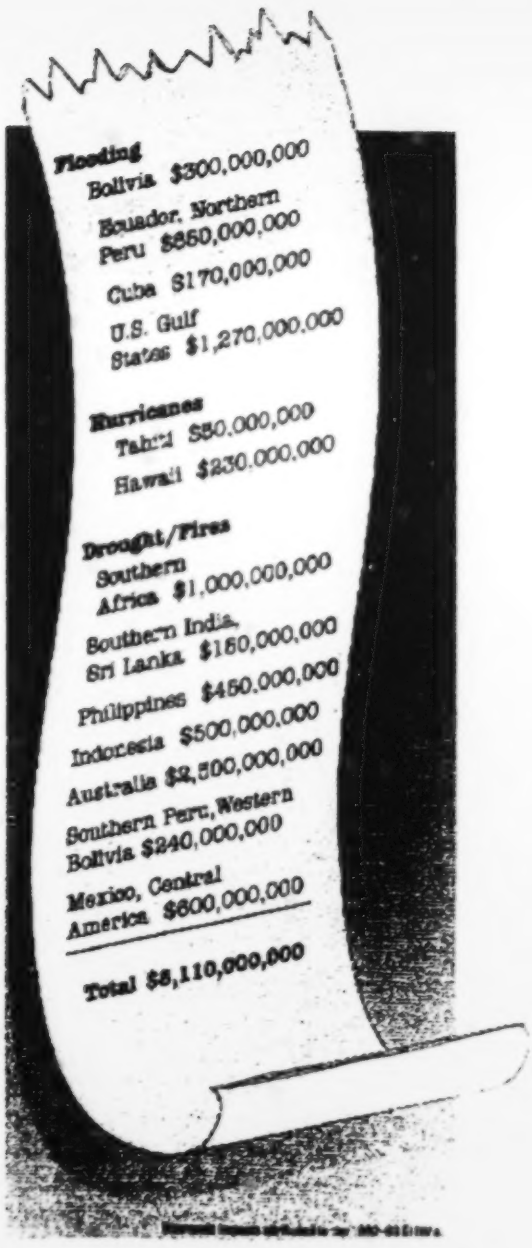

Credits

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Statistics on the Disasters of El Nino

Names:_____

Directions: Calculate the mean, median, mode, and range of each disaster. (The percentage will be used in a subsequent lesson.) Show all your work.

I. Flooding

Mean:_____

Range:_____

Median:_____

Percentage:_____

Mode:_____

I. Hurricanes

Mean:_____

Range:_____

Median:_____

Percentage:_____

Mode:_____

II. Drought/Fires

Mean:_____

Range:_____

Median:_____

Percentage:_____

Mode:_____

Time: 45-60 minutes
Materials: Worksheet containing money loss from El Nino disasters, calculator, paper, pencil, poster depicting the El Nino disasters.
The students will use the data on the monetary loss to countries due to disasters that occurred as a result of El Nino. They have already discovered that Drought and Fires were the leading disasters in monetary loss, and they will use this information along with the information on the other disasters to create a percentage of total money lost due to a particular disaster. The students will then organize this data into a pie chart using the computer program excell.

Objective: The students will determine the percentage of money lost as a result of an El Nino induced disaster. (WVIGO: M6.52, 6.12)
The students will relocate their worksheets on monetary loss, and they will pair into the same group of four from the last class session. The students will take their total monetary loss values for each disaster and use those values to determine a percentage. I will teach the students how to calculate a percentage through direct instruction, and I will allow the students to use their disaster values to also find a percentage. The groups will then be asked to look at their previous assignment, and determine if the conclusions remain the same or change when we look at the percentage of money lost from a particular disaster.

Objective Two: The students will design a pie chart, on the computer program excell, using their percentage values that they have already determined. (WVIGO: M6.24, M6.55)
The students will be assessed on their ability to use excell and to enter in the correct information to produce a pie chart of the total percentage of money lost as a result of an El Nino disaster. They will turn in a printed copy of their excell pie chart.

The students will walk together to the computer lab, and they will bring the percentage sheets that they have just calculated. They will be grouped in pairs of two, and they will work together to determine which information is appropriate to create a pie chart. The students will be required to label the chart, and they will need to enter in the appropriate information to obtain an accurate chart representing the percentage of money lost due to a particular disaster. I will assist the students in using the computer technology, and I will help them whenever needed. The students will be required to print out a copy of their final pie chart to hand in for a grade. After the laboratory assignment, I will ask the students what they thought of the lab. I will have them help me create a rubric to grade their pie charts for their grade on this particular assignment.

Time: 30-45 minutes
Materials: Worksheet, calculator, paper and pencil
The students will try to discover a pattern in El Nino over the past years.

Objective: The students will organize a timeline of the past El Nino years, and they will try to find a pattern in the occurrence. (WVIGO: M6.24)

The students will be assessed on their ability to organize a timeline, and find a pattern. They will complete the worksheet provided and submit a copy for grading.

The students will be given a worksheet on the dates of the El Nino years. The students will get into groups of four and collaborate on the worksheet. The students will be asked to record the data in a timeline, discover how often El Nino occurs, and try to discover any patterns. The groups will then be asked to share their patterns with the class. The students will analyze the group patterns, and try to find a systematic occurrence of El Nino. The students will be asked the question: "Can you make any predictions based on these patterns? Why or Why not? How often do you think that El Nino will occur in the next decade?"

Objective Two: The students will create a bar graph using the data on El Nino years provided on the worksheet. (WVIGO: M6.24)

The students will be assessed on their ability to successfully complete a bar graph of the given data. Each group will submit one graph for an evaluation. The graph will be worth 5 points.

The students will be given another worksheet to design a frequency bar graph using the data on the El Nino years. The students will work together in their groups to complete the frequency bar graph. They will be advised to use different colors for changes in frequency. Upon completion of this graph each group will be given an opportunity to post their graphs on the bulletin board. The teacher will conclude this activity by asking: "Can you make any changes in the patterns that you had originally obtained using the time? Do you think that a bar graph shows a better display of the data? Why or Why not? Would you consider using a bar graph to organize data in the future?"

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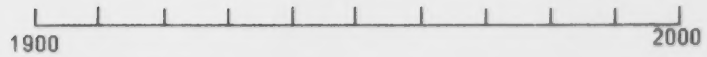
El Niño Task #3

Print and complete this page.

El Niño Years

1900-1901	1902-1903	1905-1906	1911-1912
1914-1915	1918-1919	1923-1924	1925-1926
1930-1931	1932- 1933	1939-1940	1940-1941
1941-1942	1946-1947	1951-1952	1953-1954
1957-1958	1963-1964	1965-1966	1969-1970
1972-1973	1976-1977	1977-1978	1982-1983
1986-1987	1991-1992	1993-1994	1995

1. Record the data provided in this table on a timeline below.



1. What do you notice about how often El Niño occurs?

2. What patterns do you see?

3. Create a bar graph showing the number of El Niño episodes by decade. **Print this** graph handout. Use colors and don't forget to label your graph! Note your observations of your graph in the space below.

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Name: _____ Date: _____

Frequency Bar Graph

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Time: 30-45 minutes
Materials: Worksheet, pencil, paper, and poster depicting El Nino temperatures.
In this instructional activity the students will discover the difference in temperature between a year where there was not an El Nino (1996) and a year during an El Nino period(1997). A poster will be presented to the students as a visual representation of the temperatures during an El Nino.

Objective: The students will compare and contrast the two charts provided, and they will interpret their findings by making a general assumption about the two years.(WVIGO: M6.24)

The students will be assessed on their ability to compare and contrast the two charts. They will submit a final paper containing what they thought was similar and different about the two years.

I will begin by providing the students with a worksheet containing two charts. One chart deals with the temperature of a particular area in 1996, and the other depicts the temperature during the El Nino year of 1997. The students will be asked to get into groups of four and discuss the two charts among the group. Each group will then generate a list of the similarities and differences in temperature between the two charts. The students will then interpret their findings and make a final conjecture about the two years discussed. Upon the completion of this assignment, I will ask the students to state their overall finding on the two years. I will write these conclusions on the board, and we will conclude the lesson by discussing each group's findings. The students should ultimately determine that the year without an El Nino was colder than the year with the El Nino. I will ask the questions: "Did each group come to the same conclusion about the two years? From these conclusions can we make a general assumption about the weather during an El Nino in EVERY area? Why or why not? Does the visual representation of the El Nino temperatures support your findings? Why or why not?"

I will then challenge the students to research the weather in their own particular area for one month during a year without an El Nino, and the weather during the same month with an El Nino. The students will be required to create a chart for each year, one chart for the weather with and one for without the El Nino. The students will then compare and contrast their results, and they will write a couple paragraphs summarizing these results. This assignment may be used in the student's final portfolio assessment.

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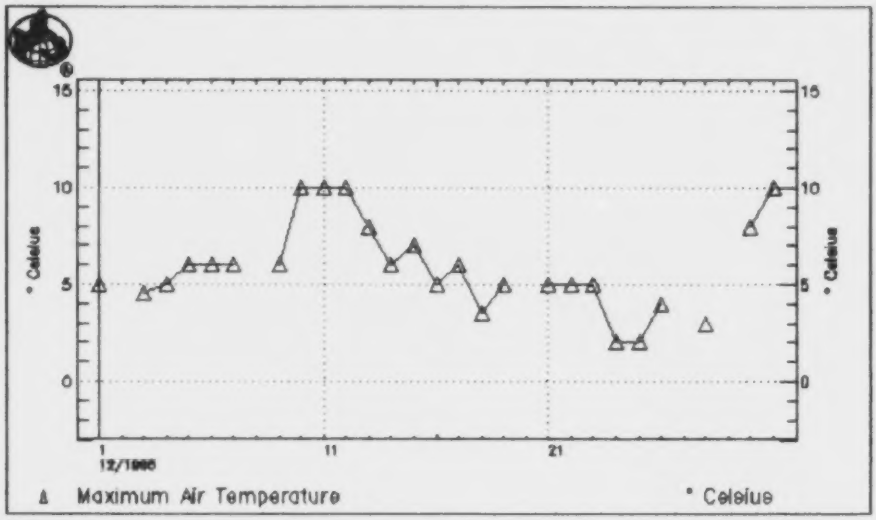
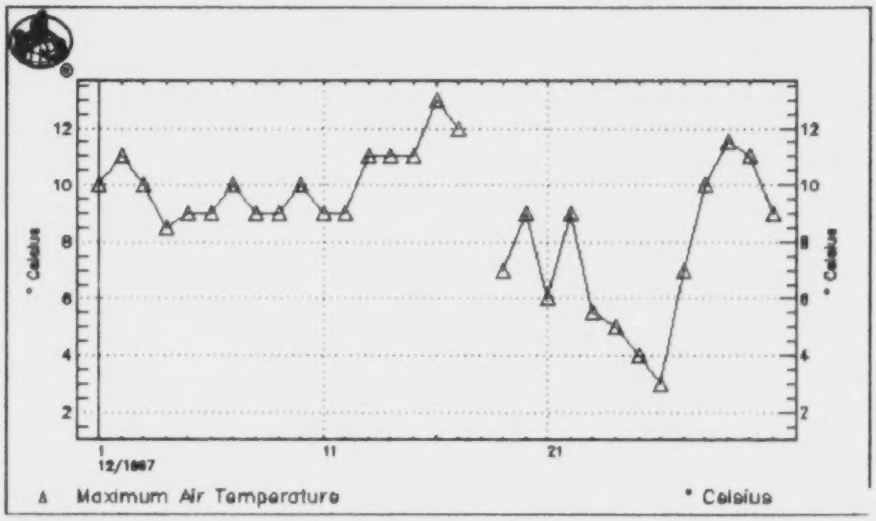
Graph Comparison

Here are the two graphs we're looking at:





Notice that on the top graph (1996), there are no values warmer than 10 C, and only 4 days at 10 C. In contrast, on the lower graph (1997), there are 8 days warmer than 10 C, and 5 others at 10 C.

Furthermore, the lowest temperature during each month is about the same (2-3 C). Therefore, overall the month of December 1997 appears to be significantly warmer than December 1996. Does this agree with your assessment?

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Graph Comparison Findings

Names:_____

Directions: Generate a list of similarities and differences in temperature between the two charts provided.

Comparison:

Similarities	vs.	Differences

From your findings what do you conclude about these two charts?

Homework: Write a brief paper on how you formed your conclusions about these two charts

Time: 30-45 minutes
Materials: Worksheet (reference:http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?WWWNolos~Product~PB-080), calculator, paper, and pencil
The students will create two histograms to discover the change in rainfall during the years without El Nino and the years with El Nino.

Objective: The students will organize data to create a histogram for analysis. (WVIGO: M6.24)

The students will be assessed on their ability to create an accurate histogram. The students will turn in their work, and they will be graded on how well they were able to set up the scale for the histogram.

The students will be provided with data on the record rainfall amounts from 1998, along with data on the previous record year. The students will work together in groups of four for this activity. There are several cities in California listed on the worksheet, and the students will be required to pick ten cities. The students will organize the data from these ten cities to create one histogram on the record rainfall for 1998, and another histogram for their record rainfall in the previous year. (The record rainfall for the previous years need not be specified on the histograms. It will suffice to show the cities and the rainfall amount). The group histograms should be colorful and neat. The completed histograms will be placed around the room, and the students can observe how the histograms change when you pick different cities.

Objective Two: The students will compare the two histograms that they created and they will make a conjecture about the rainfall in 1998, and the record rainfall in the previous years. (WVIGO: M6.24)

The students will be assessed on their ability to verbally explain their beliefs in the difference on the two histograms.

The students will work in groups, and determine the similarities and differences between the two histograms that they created. They will answer questions: "What year produced the most rainfall, 1998 or the previous record year? What can be said about the rainfall in California in 1998? Do you think that California would have as much rainfall if 1998 was not an El Nino year?"

Table 5. February 1998 Record Rainfall Amounts (inches)

Location	Total	Former Record/Year
Ukiah	22.33	19.49 in 1958
Santa Barbara	21.74	*17.33 in 1962
UCLA	20.51	*18.37 in 1918
Chatsworth	20.11	*17.71 in 1962
Oxnard	17.80	15.58 in 1962
Simi Valley	17.20	*11.15 in 1992
Northridge	15.75	*14.23 in 1962
Monterey	15.00	11.68 in 1978
San Francisco	14.89	12.52 in 1878
L.A. Cvc Ctr	13.68	13.37 in 1884
L.A. Airport	13.30	11.07 in 1962
Lompoc	12.86	11.54 in 1918
Redwood City	12.46	10.06 in 1986
Santa Maria	11.59	9.69 in 1962
Long Beach	11.22	9.66 in 1937
San Jose	10.23	7.02 in 1915
Riverside	9.49	* 6.97 in 1969
Stockton	8.01	7.34 in 1936
Bakersfield	5.36	* 4.68 in 1978

* Denotes an all-time-record February monthly total.

Reference List for Math Lessons

Corcoran, A.R. (1998). El Nino (poster). NASA(National Aeronautics and Space Administration)

This poster contains heat-induced pictures of El Nino. This can be used to visualize the temperature in different areas during an El Nino. In addition this poster provides pictures of the disasters caused by El Nino, such as floods, drought-inspired fires, and storm pounds.

This poster will be used as a visual aid for students during the lesson in which the students will discover the total money loss from El Nino inspired flooding, hurricanes, and drought/fires. This poster will also serve as a visual aid for the lesson on discovering the difference in temperature between years with and without an El Nino.

NCDC Research Customer Service Group and Satellite Services Group. (1998). The El Nino Winter of '97-'98. [on-line]. Available: http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?WWNolos~Product~PB-080.

This source includes charts containing the amount of rainfall (measured in inches) in various cities in California. The particular chart used in this unit depicts the February 1998 record rainfall amounts.

The students will use the data on this chart to create a histogram, and they will analyze the data.

(1998). El Nino Task #3. [On-line]. Available: http://www.athena.ivv.nasa.gov/curric/oceans/elnino/task3.html.

This source contains a worksheet that provides information on all of the past El Nino years.

This reference will be used to help the students discover a pattern in the past El Nino years. The students will organize the provided data into a timeline and a bar graph, and they will interpret their graphs.

(1998). Graph Comparison. [On-line]. Available: http://globe.gsfc.nasa.gov/cgi-bin/show.c...&rg=n&page=gallery-elnino-graph_interp.html

This source contains two graphs. The first graph depicts the air temperature of an area in 1996, and the second graph contains information of the air temperature of the same area in the El Nino year of 1997.

The students will compare and contrast the two charts from this source, and they will interpret their findings to make a general assumption.

(1998). [On-line]. Available: http://www.pmel.noaa.gov/toga-tao/figure22.html.

This source contains data on the El Nino induced disasters. It provides a list of monetary loss from each country affected by a particular disaster.

The students will use this data to find the total monetary loss from each disaster, and they will find the mean, median, mode, and range of the data. In addition, they will use their statistical results to find a percentage and create a pie chart.

Time: 30-45 minutes

Materials:

initial lesson overhead listing El Nino characteristics

IGOs: Language Arts 6.2, 6.4

This is the last concept lesson in the unit. It is designed to be somewhat of a capstone for the students and to bring close to the unit of study.

Objective: Students will analyze the initial list of characteristics of El Nino.
Assessment: Based on the information that has been learned in class, will reflect the answers that are given when comparing the lists. Rational answers backed up with items discussed or read will be accepted.

The initial list of characteristics will be revisited by the students. The teacher will ask the students if there are any problems with the list. Is there anything wrong with it?

Then lead into a discussion of items that should be added to the list. What things have been discussed and learned about that are not on the list?

Objective: Students will participate in a rational debate concerning El Nino.
Assessment: Students will be assessed on their ability to form opinions and have evidence to back them up. Participation in the debate is essential for success.

Introduce the question, "Can we really blame El Nino for the difference in weather?"

Discuss debate etiquette with the students. What kinds of behaviors do we exhibit in debate? What is appropriate and what isn't? Make a list of appropriate behaviors on the board that the students agree to abide by when in debate.

Allow the discussion to begin, providing promoting questions when needed. Are humans responsible for El Nino? Will our demise come from El Nino? Can we really blame El Nino for the difference in weather?

At the end of the debate, allow students to turn to a neighbor and say their opinion to them. This allows the students to feel a sense of completion without someone having to have the last word.

Then, allow the students to discuss the discussion that just ensued. Was it healthy? Did we answer the question? Were everyone's opinions respected?

Objective: Students will write a letter to a National Research Center studying El Nino, either asking for more information or making their own predictions.
Assessment: Students will be assessed according to the content of the letter, but also upon their ability to write a business letter.

Tell students that now they have all of these different ideas swarming around in their head, they are going to have the ability to try and make a difference in the world. Introduce how to write a business letter and the aspects of the letter that need to be seen on their paper. Ask the students to write to an organization of their choice about El Nino and what they think about it.